# DRIVING AUTHORIZATION SYSTEM AND CORRESPONDING OPERATIONAL METHOD, IN PARTICULAR FOR MOTOR VEHICLES

## Background Information

The present invention relates to a driving authorization system, in particular for motor vehicles, having an electronically codable recognition device fixed to the vehicle and a corresponding external electronic enabling device, which can be inserted into the recognition device, at least one vehicle-specific device being capable of being enabled in response to the recognition device recognizing the enabling device.

Although usable for any vehicle, the present invention as well as the underlying objective are explained with regard to a driving authorization system located in a motor vehicle.

To increase security, in particular protection against theft, of motor vehicles, it is known to equip the vehicles with driving authorization systems having electronic vehicle immobilizers.

For this purpose, an electronically codable recognition device fixed to the vehicle is typically provided that can be enabled by an external, electronic enabling device, a so-called transponder, which replaces the mechanical vehicle key, for example. The transponder has a storage element in which the necessary coding for enabling the recognition device is stored. So that the enabling device can communicate with the recognition device, the enabling device is to be positioned in the vicinity of the recognition device, so that a signal emitted by the recognition device, in particular via an antenna, can be detected and processed. The signal of the recognition device is checked in the enabling device and is answered with a corresponding response signal, whose signal pattern must correspond to the electronic coding of the recognition device. If the transmitted signal and the response signal of the driving authorization system match, at least one vehicle-specific device of the vehicle, e.g. an electronic control unit for controlling an internal combustion engine of the vehicle is enabled.

It is known to integrate the enabling device in an ignition key. German patent DE 33 06 863 A1 describes a steering-lock system for preventing unauthorized use of a motor vehicle, where the steering-shaft security device can be actuated by an electronic key. The steering-lock system is designed in such a manner that the further switching functions of the steering wheel lock can also be carried out using the electronic key.

**REVISED PAGE**

In this context, it is disadvantageous that in addition to the electronic communication between the recognition device and the enabling device, the ignition key as well as a corresponding ignition lock must have form features correspondingly adjusted to one another. The plurality of different master-key systems for ignition keys results in a significant expenditure to integrate an electronic driving authorization system. Preparing the driving authorization system mentioned at the outset in addition to the conventional ignition-lock system also results in an increased expenditure.

German patent DE 195 04 991 C1 describes a starting switch for a motor vehicle equipped with a transponder system for checking the driving authorization of the particular driver, the driver possessing an identification card for identification, and corresponding electronic equipment, which evaluates the signals of the identification card and, in some instances, produces signals for controlling the ignition and/or further system groups relevant for driving, being provided in the vehicle.



**REVISED PAGE**

Summary of the Invention

In comparison with the known approaches, the driving authorization system according to the present invention and having the features of Claim 1 has the advantage that the driving authorization system can at the same time also be used as an ignition-lock system.

The fundamental idea of the present invention is that the recognition device or the card reader is provided with a mechanical locking device that enables the enabling device or the card to be locked in at least one position, preferably the ignition-on-position. From the releasable locked position, the enabling device can be temporarily pressed, like a conventional ignition key, into an engine-start-position, and in response to being released after the engine is started, it returns to the ignition-on-position, which corresponds to the operating position.

Advantageously, this operating method is easily comprehended by a user who is accustomed to an ignition lock. It is also advantageous that an ignition key is no longer necessary as an accessory part, since its function can be assumed by the enabling device.

**REVISED PAGE**

In the dependent claims are advantageous further refinements and improvements of the driving authorization system indicated in Claim 1.

According to a preferred further refinement, the ignition-lock function corresponding to the one position is the ignition-on-function, and the ignition-lock function corresponding to the additional position is the engine-start-function.

According to an additional preferred further refinement, the enabling device can be forced in a releasable and lockable manner into at least one further position, which can be recognized by the actuating device, and in which the actuating device triggers a corresponding additional ignition-lock function, preferably an ignition-neutral-function.

According to another preferred further refinement, an elastic (fitted with springs) locking pin device is provided in the receiving region, the device interacting with notches provided in the enabling device to releasably lock the enabling device in the one position.

According to an additional preferred further refinement, the enabling device is a chip (smart) card that can be inserted through a slit into the receiving region.

According to another preferred further refinement, the actuating device has at least one mechanical and/or optical position sensor for detecting the enabling device in the particular position.

According to an additional preferred further refinement, the

additional position can be reached by applying pressure to the enabling device from the one position until reaching a stop, and a spring device is provided that returns the enabling device to the one position in response to the pressure no longer being applied.

According to another preferred further refinement, the actuating device triggers a communication between the enabling device and the recognition device in at least one of the positions.

Drawings

Exemplary embodiments of the present invention are represented in the drawings and are more closely explained in the description below.

The figures show:

Figure 1 shows a schematic representation of an exemplary embodiment of the driving authorization system according to the present invention and having a smart card in a first position I;

Figure 2 shows a schematic representation of an exemplary embodiment of the driving authorization system according to the present invention and having a smart card in a second position II;

Figure 3 shows a schematic representation of an exemplary embodiment of the driving authorization system according to the present invention and having a smart card in a third position III;

Figure 4 shows a schematic perspective view of a conventional receiving device;

Figure 5 shows a schematic top view of the conventional receiving device according to Figure 4;

Figure 6 shows a longitudinal cross section of the conventional receiving device according to Figure 4; and

Figure 7 shows a cross section of the conventional receiving device according to Figure 4.

Detailed Description of the Exemplary Embodiments

In the figures, the same reference numerals denote the same or functionally equivalent elements.

To better understand the basic idea of the present invention, a driving authorization system is first explained with reference to Figures 4 through 7, the driving authorization system being described in the prior application DE 197 47 732.1 dated 10/29/97 and being used as a basis for the present invention.

Figure 4 shows a receiving device 10 of such a conventional driving authorization system for motor vehicles. The subsequent description relates to the design and function of receiving device 10, it being clear that the receiving device is situated at a suitable location in the motor vehicle, e.g., on or in an instrument panel of the motor vehicle.

Receiving device 10 possesses a rectangular-shaped base 12, in which a receiving region 14 is formed. Receiving region 14 is

formed from a blind opening 16, which extends essentially across the entire depth of base 12. Blind opening 16 is provided with a slit 20 on a front side 18, so that the opening is open at the edge with respect to front side 18. Viewed from a top view, blind opening 16 has a cross section that is formed by a center section 22 and side sections 24 and 26, respectively. Slit 20 is situated in the region of center section 22, as becomes clear particularly in the schematic top view of receiving device 10 shown in Figure 5. As a result of sections 22, 24, and 26, blind hole 16 is formed by a slit-like depression having a widening of a certain contour in the region of center section 22. The contour of center section 22 follows the form design of used enabling devices. In the example shown, center section 22 is formed by an octagon. However, the center section can also be a differently shaped polygon, i.e., oval, circular, triangular, etc.

As the top view in Figure 5 clarifies, receiving device 10 also has an antenna 28, which is used for communicating with an enabling device, which can be introduced into receiving region 14. Antenna 28 is designed for exchanging high-frequency signals. An actuating device 30 having an actuating means 32, which runs in an axial direction with respect to blind opening 16 and is capable of being displaced in a radial direction with respect to blind hole 16, in opposition to the force of at least one spring element 34, is also allocated to receiving region 14. In the quiescent state, actuating means 32 lies in the changeover region between center section 22 and 3 side section 26 of blind opening 16.

In Figures 6 and 7, the design of receiving device 10 is further elucidated using both a longitudinal cross section and a cross section. There, receiving device 10 is shown with an

inserted electronic enabling device 36, which can be formed, for example, by a smart card 38, as Figure 5 clarifies in a schematic perspective view. In this context, the geometric design of enabling device 36 is particularly a smart card 38, which can be tailored to the motor vehicle or can correspond to the generally known format of telephone cards and bank cards. In this context, blind opening 16, in particular side sections 24 and 26, are adjusted to the thickness of smart card 38, so that it can be tightly inserted into blind opening 16. Enabling device 36 has electrical circuits, which are not further shown, by which it is possible to communicate with the recognition device via HF antenna 28. For this purpose, receiving device 10 can have circuit components, e.g., in the form of microcontrollers, storage devices, etc., which are also not further represented.

By inserting enabling device 36 into blind opening 16, actuating means 32 is displaced in opposition to the force of spring elements 34. As the sectional view in Figure 6 elucidates, spring elements 34 are not situated symmetrically with respect to actuating means 32, but are in a lower region of blind opening 16. As a result of the unsymmetrical support of actuating means 32 by spring elements 34, the support is preferably in the form of a wobble plate. As a result, actuating means 32 is not immediately displaced along its entire length in opposition to the force of spring elements 34 in response to enabling device 36 being inserted. At the onset of enabling device 36 being inserted, the top section of actuating means 32 is first displaced in opposition to the force of spring element 34, so that a first circuit component 40, whose actuating pin 42 lies in the path of movement of actuating means 32, is actuated. First after enabling device 36 is almost completely inserted is the lower section of

actuating means 32 also displaced in opposition to the force of spring elements 34, so that a second circuit component 44, whose actuating pin 46 is also in the path of movement of actuating means 32, can then be actuated. To insert enabling device 36 more easily, a phase (rounded-off section) 48 can be provided in the region of the mouth of blind opening 16. Circuit components 40 and 44 are connected to the electronic equipment of receiving device 10 and/or the driving authorization system via connections, which are not further shown. This electronic equipment can be integrated either in receiving device 10 or at another position, e.g. in a control unit of the motor vehicle.

As a result of the independently actuatable circuit components 40 and 44, the positioning of enabling device 36 can be detected. Circuit component 40 is first actuated, in response to enabling device 36 being inserted, and circuit component 44 is then actuated in response to the enabling device reaching its final position. Consequently, as a result of circuit component 44 being actuated, it can be detected when enabling device 36 reaches its final position. The initiation of a query of the transponder integrated in enabling device 36 can be coupled to the actuation of circuit component 44. As a result, an electronic component of the recognition device can, for example, control antenna 28, which consequently communicates with the transponder and checks the authorization of the inserted enabling device 36 via a code query. If the authorization of enabling device 36 is recognized, initial operation of the motor vehicle can be permitted by the electronic equipment, e.g. by deactivating an electronic vehicle immobilizer, making a supply voltage available for starting the motor vehicle, etc.

During operation of the motor vehicle, enabling device 36 remains in receiving device 10. In this context, the enabling device is loaded via actuating means 32, by the spring tension of at least one spring element 34, with a retention force, so that it is not possible for the enabling device to unintentionally fall out due to vibrations occurring during operation of the motor vehicle. At the same time, the correctness of the position of enabling device 36 can be checked at any time as a result of the design of slit 20. Furthermore, as a result of slit 20, enabling device 36 can be attached to a key chain, for example, together with keys not necessary for operating the motor vehicle or the like. Thus, enabling device 36 can be inserted into receiving device 10, without having to be removed from the key chain, since as a result of the design of slit 20, corresponding free space is available.

Also integrated in receiving device 10 can be a display device that, in response to the motor vehicle being enabled for operation, signals the validity of the used enabling device 36, e.g. via different colored illuminated displays. A mechanical locking mechanism can also be provided that holds enabling device 36 in its position in addition to the retention force applied by spring element 34. Instead of a mechanical locking mechanism, an electromagnetic locking mechanism can also be provided, for example. If the enabling device 36 is identified and the ignition of the motor vehicle is enabled, starting the driving motor of the motor vehicle is permitted.

The use of an additional ignition key of the like is not necessary for this system. The starting operation itself can either operate automatically in a proposed manner after

circuit component 44 is triggered, i.e., after the final position of an enabling device 36 is reached in receiving device 10 and the enabling device is successfully identified, or can be controlled by hand via a special start-triggering contact, e.g. a push-button switch, a rotary switch, or the like.

According to the design of the driving authorization system, the operation of the driving motor of the motor vehicle can be interrupted or not interrupted by removing the enabling device from receiving device 10. In response to the enabling device being removed from receiving region 14, circuit component 44 first opens and then circuit component 40. By opening circuit component 40, the complete removal of enabling device 36 is recognized, so that the driving motor can be caused to switch off via a corresponding electronic component. For security reasons, it can also be provided that, in addition to removing enabling device 36 from receiving device 10, additional signals that signal that the motor vehicle is at a still stand, for example, must be available in order to stop engine operation. For this purpose, rotational frequency values at the wheels or transmission of the motor vehicle, for example, can be read off.

Instead of the mechanically operatable circuit components 40 and 44, optically, electronically, or otherwise suitably operatable circuit components can also be provided.

As a result of the design of receiving region 14, in particular center section 22, it is ensured that receiving device 10 is at the same time suitable for the use of differently configured enabling devices 36. Thus, the enabling device can also have an irregular, oval shape, for example.

This enabling device 36 can be situated on a key chain via a hook. Due to the relatively small, compact design, the enabling device can be easily incorporated in the key chain. An exterior design of enabling device 36 then essentially corresponds to the cross section of center section 22, so that enabling device 36 can be inserted analogously to smart card 38 into receiving device 10 and comes into contact over a longitudinal surface with actuating means 32 and can, therefore, trigger circuit components 40 and 44, on the one hand, and can be loaded, on the other hand, via spring element 34 with a retention force.

In this context, there are essentially no restrictions placed on the shape of enabling device 36. In addition, enabling device 36 can have circuit components that are used for remotely locking and unlocking the vehicle's doors, for example. Infrared, ultrasonic, LF, or UHF transmitting and receiving means can be used for this purpose.

Enabling device 36 can also be designed as a key fob if receiving region 14 of receiving device 10 has a corresponding design.

Figures 1 through 3 show a schematic representation of an exemplary embodiment of the driving authorization system according to the present invention and having a smart card in a first position I, II, or III.

In Figures 1 through 3, in addition to the already introduced reference numerals, P designates an arrow direction corresponding to the insertion/extraction direction of smart card 36; 50 designates a first optical position sensor; 52 designates a second optical position sensor; 54a and 54b

designate flat springs; 60 designates a first locking pin; 61 designates a first locking pin spring; 62 designates a second locking pin; 63 designates a second locking pin spring; 70 designates a switching contact having a switching contact pin 70a; 80 and 82 designate spring devices; and 90 and 92 designate stops.

In its recognition device, the driving authorization system for motor vehicles according to this exemplary embodiment has a receiving device 10, which forms a receiving region 14, in which enabling device 36 in the form of the smart card can be forced in a releasable and lockable manner through slit 20 into a position I and into a position II.

The elastic locking pin device 60-63 provided in receiving region 14 interacts with the notches 37, 38 provided in enabling device 36 to releasably lock enabling device 36 in positions I and II. In this context, a counterpressure is applied by flat springs 54a, 54b. The mechanical guidance perpendicular to the plane of the drawing is not shown for the sake of simplification

The actuating device provided in receiving region 14 has optical position sensors 50 and 52, respectively, for detecting enabling device 36 in positions I and II, respectively.

Enabling device 36 in receiving region 14 can be forced from position II into a further position III, in which an elastic restoring force can be applied to return enabling device in the direction of position II. As can be especially inferred from Figure 3, the additional position III can be attained by pressure being applied, e.g., by the user's fingers at the

slit, to enabling device 36 from position II until reaching stop 90, 92. In this context, spring device 80, 82 is compressed, which returns the enabling device to position II in response to the pressure no longer being applied.

An electronic component (not shown) of the actuating device provided in receiving region 14 triggers an ignition-lock function corresponding to the particular position I, II, or III as well as a special communication between enabling device 36 and the recognition device in position I.

In this example, the ignition-lock function of position I is the ignition-neutral-function; the ignition-lock function corresponding to position II is the ignition-on-function; and the ignition-lock function corresponding to position II is the engine-start-function.

An example of a method for operating the driving authorization system according to Figures 1 through 3 is explained in the following.

According to Figure 1, enabling device 36 is first inserted into locking position I to activate the ignition-neutral-function, the identification taking place at the same time, and a vehicle-specific device, e.g. an electronic control unit for controlling the internal combustion engine of the vehicle and/or the power supply, being capable of being enabled in response to enabling device 36 being recognized by the recognition device. In response to a successful identification, the radio power supply or the like can be enabled as usual in this position, for example.

Pressing enabling device 36 into locking position II, leads to

the activation of the ignition-on-function, i.e., the illumination of the control lamps for the battery and oil level, the ABS test, preheating for diesel engines, etc.

Pressing enabling device 36 into position III then leads to the activation of the engine-start-function, i.e., the actuation of the starter, as long as the pressure continues to be applied.

Ending the application of pressure by releasing enabling device 36 after the engine has been successfully started causes a return to position II, in which the engine remains in operation.

Pulling enabling device 36 back from position II into position I causes the ignition and engine to be switched off. So that this does not occur inadvertently, or so that the starter is not inadvertently actuated anew as a result of the enabling device moving into position III while the engine is running, an additional separately releasable locking mechanism can be provided.

Finally, removing enabling device 36 causes the ignition-off-function to be activated and the engine to be switched off, as well as the vehicle immobilizer function to be activated in some instances.

Although the method of manufacture according to the present invention is described based on the aforementioned preferred exemplary embodiments, the method is not limited thereto, but can be modified in a plurality of ways.

In particular, the present invention is not limited to the

described mechanical locking devices and position detection devices. Also, only one releasably lockable position (e.g. II) can be provided in addition to the start position, or three of more releasably lockable positions can be provided.

Instead of the smart card, a key fob or the like can also be used in place of an ignition key.